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# Industrial Surface Coating: Large Appliances Background Information for Promulgated Standards

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Research Triangle Park, NC

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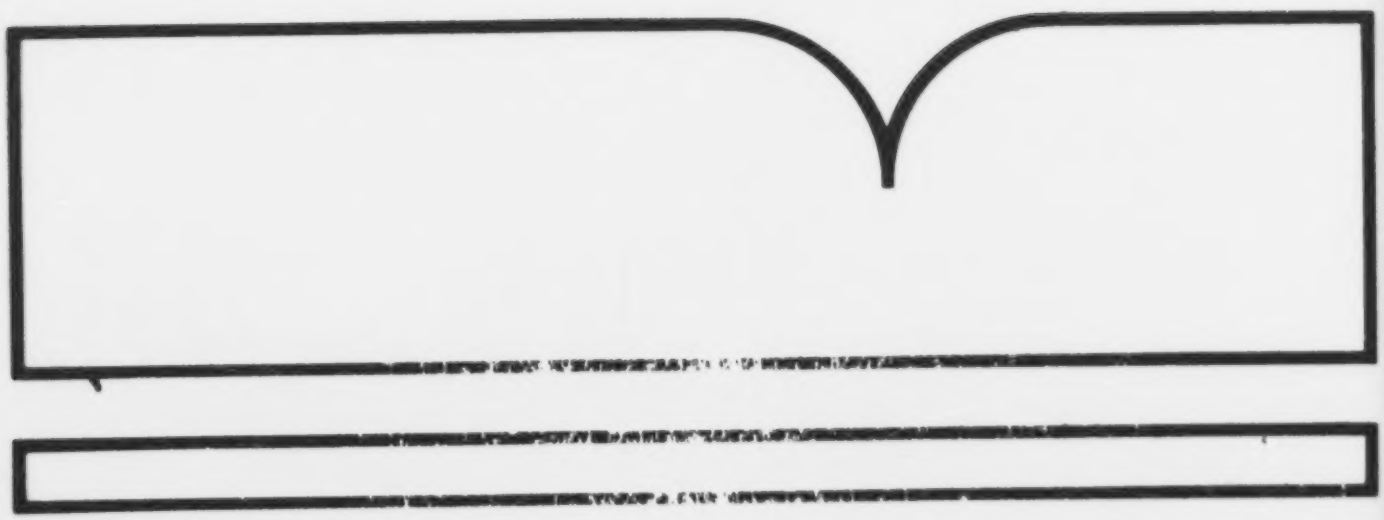

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16. ABSTRACT

Standards of performance are being promulgated under Section 111 of the Clean Air Act to control volatile organic compound emissions from new, modified, and reconstructed large appliance surface coating operations. This document contains a detailed summary of the public comments on the proposed standards (45 FR 85085), responses to these comments and a summary of the changes to the proposed standards.

17. KEY WORDS AND DOCUMENT ANALYSIS

| a. DESCRIPTORS | b. IDENTIFIERS/OPEN ENDED TERMS | c. COSATI Field/Group |
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Research Triangle Park NC 27711

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# Industrial Surface Coating: Large Appliances— Background Information for Promulgated Standards

Emission Standards and Engineering Division

U.S. ENVIRONMENTAL PROTECTION AGENCY
Office of Air, Noise, and Radiation
Office of Air Quality Planning and Standards
Research Triangle Park, North Carolina 27711

October 1982

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Publication No. EPA-450/3-80-037b

ENVIRONMENTAL PROTECTION AGENCY

Background Information
and Final
Environmental Impact Statement
for Industrial Surface Coating: Large Appliances

Prepared by:

Don R. Goodwin 10/25/82

(Date)

Don R. Goodwin
Director, Emission Standards and Engineering Division
U.S. Environmental Protection Agency
Research Triangle Park, NC 27711

1. The promulgated standards of performance will limit emissions of volatile organic compounds from new, modified, and reconstructed large appliance surface coating operations. Section 111 of the Clean Air Act (42 USC 7411), as amended, directs the Administrator to establish standards of performance for any category of new stationary source of air pollution which ". . . causes or contributes significantly to air pollution which may reasonably be anticipated to endanger public health or welfare." The States of Ohio, Illinois, Michigan, Kentucky, Tennessee, and California would be particularly affected.

2. Copies of this document have been sent to the Office of Management and Budget; the Federal Departments of Labor, Health and Human Services, Defense, Transportation, Agriculture, Commerce, Interior, and Energy; the National Science Foundation; the Council on Environmental Quality; to members of the State and Territorial Air Pollution Program Administrators (STAPPA) and the Association of Local Air Pollution Control Officials (ALAPCO); to EPA Regional Administrators; and to other interested parties.

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# 1. SUMMARY

On December 24, 1980, the U.S. Environmental Protection Agency (EPA) proposed a standard of performance for appliance surface coating operations (45 FR 85085) under authority of Section 111 of the Clean Air Act. The Federal Register notice requested public comments on the proposal. There were 19 commenters, most of whom were appliance manufacturers, and the others were coating manufacturers, trade associations, and State and Federal Government offices. Three presentations were made at the public hearing on January 28, 1981. Comments submitted and their responses are summarized in this document. The bases for revisions made to the standard between proposal and promulgation are also described in this document.

## 1.1 SUMMARY OF CHANGES SINCE PROPOSAL

A number of changes have been made since proposal of this standard. The most significant change to the regulation involved the definition of "large appliance product." Large appliance products are now defined as ranges, ovens, microwave ovens, refrigerators, freezers, washers, dryers, dishwashers, water heaters, and trash compactors. The following appliance products have been excluded from the list of products originally proposed and will not be subject to this regulation: range hoods, refrigerated display cases, dry cleaning equipment, vacuum cleaners, ice makers, water softeners, interior lighting fixtures, air purifiers, room heaters, baseboard heaters, dehumidifiers, humidifiers, fans, furnaces, window air conditioners, unitary air conditioners, and heat pumps.

The definition of "large appliance surface coating line" has been changed to include only coating operations within large appliance

assembly plants. This alteration is specifically intended to exclude operations that coat only certain parts, such as compressors, which are sold to a variety of large appliance manufacturers.

Definitions of "organic coating," "powder coating," and "VOC content" were added to describe more completely the surface coatings covered in the standard. Powder coatings have been excluded from the definition of an "organic coating," thereby clarifying that powder coating users are not affected by any requirement in the regulation.

Another change to the regulation involved adding an in-use temperature cutoff to the definition of "large appliance part." This cutoff will ensure that no high-temperature-resistant coatings, some of which are metal-based, are unintentionally covered by this standard.

Section 60.453 (Performance test and compliance provisions) has been restructured in order to be more easily followed and understood. The results of the calculations required are identical to those in the proposed standard, but the manner and order in which they are performed have changed. Numerous editorial changes have also been made for ease of understanding. In addition, a provision has been added that will allow an owner or operator to petition the Administrator for a case-by-case determination of the transfer efficiency of any application method not listed in the regulation.

As a result of an internal EPA reevaluation, all reporting requirements have been deleted from this regulation. Monitoring and recordkeeping sufficient to verify the calculation of monthly emissions from each affected facility are required. No reports will be made to EPA, however, except those found in the General Provisions to 40 CFR Part 60 concerning notification and the results of the initial performance test.

## 1.2 SUMMARY OF IMPACTS OF THE PROMULGATED ACTION

### 1.2.1 Alternatives to Promulgated Action

The regulatory alternatives are discussed in Chapter 6 of the Background Information Document (BID) for the proposed standard. These regulatory alternatives reflect the different emission control

levels from which one will be selected to represent best demonstrated technology (BDT), considering costs, nonair quality health, and environmental and economic impacts for large appliance surface coating. These alternatives remain the same.

1.2.2 Environmental Impacts of Promulgated Action

Environmental impacts that would be incurred under each of the regulatory alternatives are described in Chapter 7 of the BID for the proposed standard. These impacts remain unchanged.

1.2.3 Energy and Economic Impacts of Promulgated Action

Energy and economic impacts are discussed in Chapters 7 and 8 of the BID for the proposed standard. These impacts are unchanged.

1.2.4 Other Considerations

1.2.4.1 Irreversible and Irretrievable Commitment of Resources. Irreversible and irretrievable commitment of resources is described in Chapter 7 of the BID and has remained unchanged since proposal.

1.2.4.2 Environmental and Energy Impacts of Delayed Standards. Environmental and energy impacts are described in Chapter 7 of the BID and have remained unchanged since proposal.

# 2. SUMMARY OF PUBLIC COMMENTS

A list of commenters, their affiliations, and the EPA docket entry number assigned to each comment are shown in Table 2-1. Twenty-one letters commenting on the proposed standard and the Background Information Document (BID) for the proposed standard were received, and three industry representatives commented at the public hearing. Significant comments have been combined into the following seven categories:

1. General
2. Emission Control Technology
3. Modification and Reconstruction
4. Economic Impact
5. Environmental Impact
6. Energy Impact
7. Reporting and Recordkeeping

Comments, issues, and their responses are discussed in the following sections of this chapter. Changes to the regulations are summarized in Subsection 1.2 of Chapter 1. Many written comments and public hearing presentations fell into more than one of the above categories, relating to the list of large appliance products to be covered by the standard and associated economic impacts and record-keeping requirements. These comments are addressed as part of the "general" category to avoid duplication of comments and responses in each of the categories.

TABLE 2-1. LIST OF COMMENTERS ON THE PROPOSED STANDARD OF PERFORMANCE FOR INDUSTRIAL SURFACE COATING: APPLIANCES

| Docket entry number[a] | Commenter/affiliation |
|---|---|
| IV-D-1, D-9, D-15, F-1a | Hayward Thomas, Senior Vice President<br>Broan Manufacturing Company, Inc.<br>Hartford, Wisconsin 53027 |
| IV-D-2 | Walter G. Davies, Sr.<br>Davies Engineering Company<br>505 Cherokee Boulevard<br>Chattanooga, Tennessee 37405 |
| IV-D-3 | C. E. Baldwin, Vice President--Manufacturing<br>Miami Carey<br>203 Garver Road<br>Monroe, Ohio 45050 |
| IV-D-4 | Gary L. Ewing, Engineering Manager<br>Hamilton County (Tenn.) Air Pollution Control Bureau<br>3511 Rossville Boulevard<br>Chattanooga, Tennessee 37407 |
| IV-D-5 | John M. Lipscomb, Chairman<br>Transfer Efficiency Committee<br>The Chemical Coaters Association<br>Post Office Box 241<br>Wheaton, Illinois 60187 |
| IV-D-6 | Andrew Nogueira, Finishing Engineer<br>Scovill-Nutone Division<br>Madison & Red Bank Roads<br>Cincinnati, Ohio 45227 |
| IV-D-7, D-17, F-1b[b] | Donn W. Sanford, Executive Director, CAE<br>Home Ventilating Institute<br>4300-L Lincoln Avenue<br>Rolling Meadows, Illinois 60008 |
| IV-D-8 | Steven J. Gunsel, Environmental Specialist<br>Nordson Corporation<br>Amherst, Ohio 44001 |
| IV-D-10 | Harlan J. Lortz, Vice President--Product Safety<br>Amana Refrigeration, Inc.<br>Amana, Iowa 52204 |

See footnotes at end of table. (continued)

TABLE 2-1. (continued)

| Docket entry number[a] | Commenter/affiliation |
|---|---|
| IV-D-11 | Frank J. Senters, Vice President--Sales<br>J. Landau & Company, Inc.<br>Post Office Box 135, 214 Washington Avenue<br>Carlstadt, New Jersey 07072 |
| IV-D-12 | Kent W. Larson, Attorney<br>Graco, Inc.<br>Post Office Box 1441<br>Minneapolis, Minnesota 55440 |
| IV-D-13 | Rodney L. Pennington, Sales Manager<br>Regenerative Environmental Equipment Company, Inc.<br>Box 600, 520 Speedwell Avenue<br>Morris Plains, New Jersey 07950 |
| IV-D-14 | Jim Sasser, United States Senator<br>United States Senate<br>403 Federal Office Building<br>Memphis, Tennessee 38103 |
| IV-D-16, F-1c | T. H. Goodgame, Director<br>Corp. Environmental Control<br>Whirlpool Corporation<br>Monte Road<br>Benton Harbon, Michigan 49022 |
| IV-D-18 | Howard Baker, United States Senator<br>United States Senate<br>Washington, D.C. 20510 |
| IV-D-19 | James F. McAvoy, Director<br>State of Ohio Environmental Protection Agency<br>Box 1049, Broad Street<br>Columbus, Ohio 43216 |
| IV-D-21 | Barry L. Malter, Attorney<br>Howrey & Simon<br>1730 Pennsylvania Avenue, N.W.<br>Washington, D.C. 20006 |
| IV-H-1 | Carl W. Penland<br>Director, Environmental Affairs Division<br>General Services Administration<br>Washington, D.C. 20405 |

See footnotes at end of table.

(continued)

TABLE 2-1. (continued)

| Docket entry number[a] | Commenter/affiliation |
|---|---|
| IV-H-2 | Lynne R. Harris<br>Environmental Affairs Advisor<br>National Institute for Occupational Safety and Health<br>Rockville, Maryland 20852 |

[a]These designators represent docket entry numbers for Docket No. A-80-06. These documents are available for public inspection at: U.S. Environmental Protection Agency, Central Docket Section, West Tower Lobby, Gallery 1, Waterside Mall, 401 M Street, S.W., Washington, D.C. 20460.

[b]Mr. Sanford's prepared remarks were presented at the public hearing by Mr. Oakes.

2.1 GENERAL

2.1.1 Comment: Several commenters said that the numerous small appliances manufactured by the home ventilating industry should not be covered by the appliance standard for the following reasons.

(IV-F-1a, IV-F-1b) The home ventilating industry is not the same as the large appliance industry in that different types of coatings and application equipment are used, line speeds are generally slower (30 to 40 feet per minute for appliances and 8 to 10 feet per minute for home ventilating products), product size and production volume are smaller, and transfer efficiencies are lower.

(IV-F-1a, IV-D-1, IV-D-6, IV-D-9, IV-D-17) One company commented that its range hoods are coated with a single-coat, modified alkyd baking enamel formulated for a hot, grease-laden environment. Specifications for this coating differ from specifications for acrylic coatings used in the large appliance industry. Another commenter stated that the available high-solids coatings were inadequate for coating irregularly shaped objects like range hoods and fans. Although much of the coating equipment used in the home ventilating industry is similar to that used in the large appliance industry, distinct shape differences for some parts make spinning disc electrostatic equipment, which is common in the large appliance industry, impractical for coating range hoods with high-solids coatings. Compliance coatings are reasonably available for the five major appliance colors but are not reasonably available for the other thirteen colors and color combinations used for range hoods. (A similar comment concerning the availability of high-solids coatings in many colors was also received from one manufacturer of refrigerated display cases [IV-D-21].) While approaches to the development of new, low-solvent coatings and new, efficient application systems for home ventilating products show promise (waterborne and high-solids coatings; exempt solvents, powder coatings, and electrodeposition [EDP]), they are still in the experimental stage.

(IV-F-1c, IV-D-5, IV-D-9, IV-D-15a, IV-D-17) The manufacturing environments of the large appliance and small appliance industries

have some distinct differences, which warrant separate regulation of their coating operations. Failure to recognize these differences will allow unfair advantage to a few industries. Line speeds in large appliance plants are faster, and coating operations of the two industries are not similar. (A similar comment concerning the differences in coating systems was also received from one manufacturer of refrigerated display cases [IV-D-21].) Large appliance plants make one or two products using a two-coat system, while home ventilating plants make a wide variety of products using a single-coat system. The coating technology is not as advanced in the small shops making the small appliances. Small appliance application equipment, like large appliance application equipment, will have to undergo modification before high-solids coatings are used. However, existing small appliance coating application equipment does not approach the 60-percent assumed average transfer efficiency for large appliances.

Often, in the home ventilating industry, parts of several appliance products are coated on the same line. As different standards might then exist for different products, productivity would suffer while the line was changed to comply with whatever standards might apply to the units being coated. If the most stringent standard were used for all products coated on this hypothetical line, those not covered (but coated in compliance, nevertheless) might no longer be competitive with products made by manufacturers who did not have to comply. Different standards might also apply to different lines within a plant. One of the commenters (IV-D-15a) stated that because of time constraints and limited resources he was unable to provide complete cost information on the range hood/fan segment of the industry, and, therefore, only noted that the model plants used in the economic analysis are not typical of this segment of the industry.

(IV-F-1b, IV-D-3, IV-D-9, IV-D-17) Several comments dealt with the economic impact of the proposed standard upon the manufacturers of range hoods, fans, and other small appliances. One commenter stated that range hoods and fans could be coated in compliance with the 0.90 kilogram of volatile organic compounds (VOCs) per liter of

applied coating solids if cost considerations were ignored. Another commenter stated that because of recent costly changes to comply with existing standards and the current economic situation, neither the industry nor its customers could afford the additional financial burden the standard would impose.

One commenter indicated that because of differences between the cost of coating a large flat surface and coating products like range hoods and household fans, the proposed regulation would add 5 percent or more to the cost of a typical range hood. At least two companies predict plant closures as a result of the regulation.

Cost estimates of recordkeeping and reporting requirements for companies in the home ventilating industry ranged from $20,000 per year for one multiplant firm to $225,000 per year for another. A minimum of $5,000 annually per plant was estimated.

(IV-D-14, IV-D-18) The Agency proposal to reclassify fans from miscellaneous metal parts to large appliances, reducing allowable VOC content of complying coatings from 3 lb/gal to 2.8 lb/gal, is protested because fans have different finishing requirements than do large appliances. The fan industry has a large number of small- and medium-sized plants that would be burdened beyond their financial capabilities by classification in this more restricted category.

Response: The majority of data upon which the proposed standard was developed pertained to the surface coating of traditional household appliances such as ranges, microwave ovens, ovens, refrigerators, laundry equipment, and freezers. This information is contained in the proposed standard's BID. The decision to regulate the manufacture of 17 other appliance products (range hoods, refrigerated display cases, dry cleaning equipment, water softeners, interior lighting fixtures, vacuum cleaners, ice makers, air purifiers, baseboard heaters, room heaters, humidifiers, dehumidifiers, fans, furnaces, window air conditioners, unitary air conditioners, and heat pumps) was made subsequent to development of the majority of the background information. This decision was made because the coating application methods appeared to be identical to

those used in large appliance coating operations and because the coating materials and coating performance specifications also appeared to be similar to those used in the large appliance industry. Therefore, there appeared to be no technical reason to exclude these other appliance products.

Based upon the comments received, however, EPA agrees that in the absence of additional analysis and study, it is inappropriate to conclude that best demonstrated technology (BDT) for the manufacture of traditional large appliances also applies to the manufacture of these other appliances. As a result of the reevaluation prompted by these comments, the entire group of 17 other appliance products listed above has been deleted from the standard. This is not to imply that none of these industries can achieve the level of control required by this standard. This or even more stringent requirements may be appropriate in the application of best available control technology (BACT) or lowest achievable emission rate (LAER).

2.1.2 Comment: (IV-F-1c, IV-D-16) One commenter stated, both during the public hearing for this standard and in a subsequent letter, that one company in its corporation uses an aluminum-based coating on gas furnace parts that are subject to very high temperatures (1,000° F) and may use similar coatings on certain parts of gas dryers and water heaters. While the coating solids are inorganic, the material is spray applied with an organic carrier that yields organic-solvent emissions. A question exists as to whether this coating would be considered an "organic coating." If so, it would not meet the standard nor would any other temperature-resistant coating known to the commenter.

Response: Although an "organic coating" was not defined explicitly in the proposed standard, EPA considers any coating that yields VOC emissions to be organic. For clarification, a definition of an "organic surface coating" has been added in Section 60.451 of the final regulation. In addition, the specific problem raised by the commenter is corrected in the final version of the standard by incorporating a temperature cutoff into the regulation. After several

industry representatives were consulted,[1] [2] [3] 250° F was selected as the cutoff because coatings required to withstand heat in excess of this temperature are difficult, if not impossible, to formulate at the 62-percent (vol.) solids level. The coating of appliance parts that are subject to in-use temperatures above 250° F, therefore, is not subject to the emission limitations in this standard.

2.1.3 Comment: (IV-F-1b) One commenter stated that confusion exists within certain segments of the industry concerning implementation and the economic impact of the proposed standard.

Response: The source of confusion was a misunderstanding of the proposed standard's applicability. The commenter's main concern was that existing facilities would no longer be subject to the reasonably available control technology (RACT) emission limit but would now be subject to the more stringent New Source Performance Standard (NSPS) limit. A definition of which facilities will be affected was outlined in the proposed regulation; however, EPA has made a special effort to explain the difference between State RACT-based regulations for existing sources and the Federal NSPS for new sources and their applicability for modified and reconstructed sources at the public hearing, at a meeting with member representatives of an appliance trade association, and in correspondence with industry.[4] [5] [6]

As discussed in these documents, EPA issued a series of guidelines to the States during 1977 and 1978 to help them meet the ambient air quality standard for ozone by reducing organic-solvent emissions from existing industrial coating operations. These VOCs are precursors in the formation of ozone and photochemical smog. EPA issued guidelines to the States for "miscellaneous metal parts" and "large appliances." These guidelines for State regulations governing existing manufacturing plants have not been changed.

This Federal NSPS would cover only new sources--those that commenced construction, modification, or reconstruction after December 24, 1980. Modified sources are those that have undergone a physical or operational change that resulted in increased emissions;

reconstructed sources are those that have had components replaced at a cost exceeding 50 percent of the cost of a comparable new facility, and it would be technologically and economically feasible for them to comply with the NSPS. Sections 60.14 and 60.15 of the General Provisions to 40 CFR Part 60 provide specific conditions under which a source would become subject to the standard because of modification or reconstruction.

2.1.4 Comment: (IV-D-9, IV-D-17, IV-F-1a) One commenter expressed concern that the proposed standard was unduly restrictive in that it did not allow use of the "bubble concept," whereby credit for overcompliance on one line could be used to offset noncompliance coatings on another line. Other commenters stated that many firms manufacturing smaller appliances finished several products on a single line.

Response: The "bubble concept" refers to application of a standard to an entire plant rather than to separate portions of an individual plant. The term "affected facility" refers to the particular portion of a plant to which a standard applies. In this case, the affected facility has been defined as a surface coating operation, which consists of a coating application station(s), flashoff area(s), and oven. The choice of the affected facility for any standard is based on the Agency's interpretation of the Clean Air Act, as amended, and judicial construction of its meaning. Under Section 111, the NSPS must apply to "new sources;" a "source" is defined as "any building, structure, facility, or installation which emits or may emit any air pollutant" [Section 111(a)(3)]. Most industrial plants, however, consist of numerous pieces or groups of equipment that emit air pollutants and that might be viewed as "sources." EPA uses the term "affected facility" to designate the equipment, within a particular kind of plant, that is chosen as the "source" covered by a given standard.

In choosing the affected facility, EPA must decide which pieces or groups of equipment are the appropriate units for separate emission standards in the particular industrial context. One major consideration in this decision is that use of a narrower definition results in bringing replacement equipment under the NSPS sooner. If, for example, an entire plant were designated the affected facility, no part of the plant would be covered by the standard unless the plant as a whole were "modified." If,

on the other hand, each piece of equipment were designated the affected facility, as each piece were replaced, the replacement piece would be a new source subject to the standard. Since the purpose of Section 111 is to minimize emissions by the application of the best demonstrated control technology (considering cost, other health and environmental effects, and energy requirements) at all new and modified sources, there is a presumption that a narrower designation of the affected facility is proper. This ensures that new emission sources within plants will be brought under the coverage of the standards as they are installed. This presumption can be overcome, however, if the Agency concludes that the relevant statutory factors (technical feasibility, cost, energy, and other environmental impacts) point to a broader definition. As shown in the BID, it is both technologically and economically feasible to control each coating operation. Since selecting this narrowest definition of the affected facility would achieve the greatest emission reduction, this definition is most consistent with the purposes of Section 111.

Two other possible definitions of the affected facility for this standard are all prime coat (or topcoat) operations in a product line and all prime coat (or topcoat) operations within an assembly plant. The product line definition would have reduced the number of affected facilities and would have permitted tradeoffs between different coatings and application technologies. Likewise, defining all prime coating (or topcoating) operations within a plant as the affected facility would have reduced the number of affected facilities and, consequently, the associated recordkeeping and compliance calculations. However, such definitions would not necessarily result in either the use of best technology or the minimizing of emissions from new sources. For these reasons, the Agency has chosen each surface coating operation as the affected facility.

The specific concern of small appliance manufacturers who finish several products on a single line that different standards would apply to different products on the same coating line is no longer applicable since the manufacturers of these products are not subject to the promulgated standard. The Agency is not aware of any large appliance manufacturers finishing several products on a single line who might encounter this situation.

2.1.5 Comment: (IV-D-10, IV-F-1b) One commenter said that the proposed regulation has been developed and released for review on such a short time schedule that the Home Ventilating Institute, a trade association for the home ventilating industry, had inadequate time to research the technical aspects and determine the economic impact. Another commenter (IV-D-10) opposed implementation of the proposed standard at this time for the following similar reasons:

- The proposed standard was hastily put together with little or no consultation with industry, and there was short notice for a public hearing; and
- The public comment period was less than 60 days, hardly adequate for this proposed standard.

Response: Development of this regulation started in October 1978, with the first industrial contacts made in November 1978. A Source Category Survey Report (SCSR) was completed in February 1979. By June 1980, the technical and economic information for the standard had been reviewed within EPA and had been presented to the National Air Pollution Control Techniques Advisory Committee (NAPCTAC). NAPCTAC is composed of representatives from industry, State, and local air pollution control agencies, as well as from environmental and public interest groups. A month before the NAPCTAC meeting, drafts of the proposed regulation and supporting documentation were sent to all known interested parties for review and comment. (Although it is impractical for EPA to verify and contact all interested industry representatives, the Agency contacted and visited numerous appliance manufacturers, coating manufacturers, and equipment manufacturers during the development process. These contacts are listed in Docket Category II. A notice to the public was also placed in the Federal Register inviting participation at the NAPCTAC meeting.

Comments from these meetings were considered and incorporated into the proposed standard, which was published in the Federal Register December 24, 1980. A public hearing was held January 28, 1981. Written comments were accepted for consideration even after official closing of the comment period February 23, 1981. EPA has determined that a public comment period of about 60 days after proposal is appropriate and is sufficient to allow

interested parties to participate in the rulemaking process. Therefore, the Agency considers the time thus allowed adequate for public and industrial participation in development of this standard.

It should also be noted that neither of the two commenters requested an extension of the public comment period.

2.1.6 Comment: (IV-D-10) One commenter opposed implementation of the proposed standard at this time because he considered additional regulations unnecessary and overly burdensome and thought industry deserves to be advised of the real need for VOC standards more stringent than those now imposed.

Response: Standards of performance are promulgated under Section 111 of the Clean Air Act. Section 111(b)(1)(A) requires that the Administrator establish standards of performance for categories of new, modified, or reconstructed stationary sources that in her judgment cause or contribute significantly to air pollution that may reasonably be anticipated to endanger public health or welfare. Standards of performance prevent new air pollution problems from developing by requiring application of the best technological system of continuous emission reduction that the Administrator determines to be adequately demonstrated. The 1977 Amendments to the Clean Air Act added the words, "in the Administrator's judgment," and the words, "may reasonably be anticipated," to the statutory test. The legislative history for these changes stresses two points:

- The Act is preventive, and regulatory action should be taken to prevent harm before it occurs; and
- The Administrator should consider the contribution of each single class of sources to the cumulative impact of all VOC emitters.

The 1977 Amendments to the Clean Air Act also required that the Administrator promulgate a priority list of source categories for which standards of performance are to be promulgated. The priority list, 40 CFR 60.16, was promulgated in the Federal Register August 21, 1979 (44 FR 49225). Development of the priority list was initiated by compiling data on a large number of source categories from literature resources.

Major stationary source categories were then subjected to a priority ranking procedure using the three criteria specified in Section 111(f) of the Act. The procedure ranks source categories on a pollutant-by-pollutant basis. In this ranking, first priority was given to the quantity of emissions, second priority was given to the potential impact on health or welfare, and third priority was given to the mobility and competitive nature of the source category.

In light of the considerations stated above, the Administrator found that the large appliance coating industry is a "significant contributor." (Applying the criteria for prioritizing such contributors, the Administrator ranked the surface coating of large appliances 28th of 59 source categories on the priority list.) This listing decision requires the Agency to promulgate standards of performance for new sources in this category.

Another study was conducted to investigate the large appliance surface coating industry in more detail. This study resulted in development of the BID, which specifically addressed the industry in terms of structure, processes, and emission control techniques. The BID also described modification and reconstruction; alternative regulatory options; and the environmental, economic, and energy impacts that would be associated with implementing each of the various regulatory options. During this study it was estimated that a minor reduction in emissions would result from the proposed regulations, primarily because of the dramatic improvements already achieved by State regulations. However, the regulation has other benefits in addition to reducing emissions beyond those required in State regulations. The transfer efficiency concept incorporated in this regulation was not included in the Control Technique Guidelines (CTG) document. Its inclusion here is a major benefit because specifying an emissions limit based upon a specific VOC content and transfer efficiency automatically incorporates an equivalency provision into the regulation and allows tradeoffs between VOC content and transfer efficiency. That is, an operator using application equipment with a high transfer efficiency could use a coating with a higher VOC content. Such a provision also enables the diverse coatings and application techniques within the industry to be accommodated by a single standard.

Also, standards of performance establish a degree of national uniformity, which precludes situations in which some States may attract industries by relaxing air pollution standards relative to other States. They improve the efficiency of case-by-case determinations of BACT for facilities located in attainment areas and LAER for facilities located in nonattainment areas, by providing a starting point for the basis of these determinations. This starting point results from the process of developing a standard of performance, which involves comprehensive analysis of alternative emission control technologies and evaluation and verification of emission test methods.

For these reasons, as well as for the estimated emission reduction of several hundred tons per year, VOC emissions from large appliance surface coating operations have been selected for regulation under an NSPS.

2.1.7 Comment: (IV-D-8) Key operating parameters of application equipment should be checked regularly to ensure that equipment is being operated in accordance with manufacturers' specifications. These checks could be performed at the same time monthly determinations of VOC emissions compliance are made. It is recommended that the Agency encourage operator training by offering an incentive in the form of additional transfer efficiency credits for firms that have operator training programs.

Response: Proper operation and maintenance of facilities is required in Section 60.11(d) of the General Provisions of 40 CFR Part 60. Although EPA certainly encourages industry to provide adequate training for their spray equipment operators, a program that would "credit" operator training is not within the scope of EPA's regulatory development program. The training program's adequacy would have to be monitored, and the implementation and enforcement requirements are considered to be excessive. Decreases in coating use, part rejection, and maintenance are major economic incentives for a company to implement an operator training program. The Agency believes these reasons are sufficient to encourage proper operation and maintenance of application equipment.

2.1.8 Comment: (IV-D-4, IV-D-11, IV-D-2) Three commenters noted that technical requirements for surface coating of coal and wood stoves, furnaces, and room heaters are not similar to surface coating of large

applicances in that high temperature requirements preclude use of water-based coatings. High-solids coatings are also not available to meet these performance specifications. Consequently, wood stoves, furnaces, and room heaters should be classified as miscellaneous metal parts and products with extreme performance characteristics and should not be covered in this regulation.

Response: Wood stoves and direct-fired room heaters were never intended to be included in this regulation. Although one commenter indicated successful testing of a coating that could achieve the proposed emission limit (IV-D-11), EPA does not have sufficient data to conclude that such coatings have been adequately demonstrated. Because the coating of large appliance parts exposed to extreme temperatures was not intended to be subject to the proposed standard, the definition of large appliance parts to be covered by this regulation has been clarified. In addition, furnaces and room heaters have been excluded from the list of products to be covered by this regulation.

2.1.9 Comment: (IV-F-1c) One commenter noted a typographical error in Section 60.453 of the proposed regulation, stating that N should be equal to or less than 0.90 kg/ℓ.

Response: This error is corrected in the final version of the standard but was also corrected in 46 FR 9130, January 28, 1981.

2.1.10 Comment: (IV-H-2) One commenter stated that in Subsection 4.4 of the BID, the first sentence should read, "Process designs in other coating industries allow emissions to be controlled easily by the control devices, which are usually carbon adsorption units or incinerators," not captured. In Subsection 4.4.2, the first sentence should read "Incineration is the most universally applicable technique for oxidizing the emission of volatile organics from industrial processes," not reducing, because some readers may object to the term "reducing" to describe an oxidizing process.

Response: For the first question, captured is the word and concept EPA intends. Any control device must first capture a pollutant, at a certain efficiency, before the pollutant can either be destroyed or retained for reuse. For the second question, while the verb reducing is correctly used to describe a decrease in total emissions, it can be seen

how a reader, especially a chemist, could misinterpret the intended meaning. The word abating might have been a better choice. The use of the verb reducing has no implication, in this sentence, to the physical-chemical process of oxidation-reduction. Despite this possible misinterpretation, no problem is expected by leaving the statement as written.

2.2 EMISSION CONTROL TECHNOLOGY

2.2.1 Comment: (IV-D-3) One commenter stated that bath and kitchen fans, range hoods, bath cabinets, and mailboxes should not be reclassified from metal furniture to large appliances. In most cases, these products have different coating specifications than do large appliances.

Response: For NSPS development, bath cabinets are still classified as metal furniture, while bath and kitchen fans and range hoods never were. These appliances were included in the proposed standard. However, as discussed in Subsection 2.1, several small appliances were excluded from this standard, fans and range hoods among them. Mailboxes were not included in either the metal furniture or appliance NSPS. However, they are classified as miscellaneous metal parts and products in the CTG document for existing sources.

2.2.2 Comment: (IV-D-5, IV-D-8, IV-D-12) Several commenters stated that the proposed standard is inequitable because the concept of assumed transfer efficiency does not account for the following parameters:

- Part configuration,
- Different types of coatings,
- Different solids levels,
- Different resin types,
- Different charging voltages,
- Flow rate,
- Operator efficiency,
- Local environmental conditions, and

- Interaction of all of the above variables with each type of application equipment.

Two of these commenters (IV-D-12, IV-D-8) suggested that spray equipment manufacturers have not had adequate opportunity to suggest an appropriate means of incorporating transfer efficiency into the standard. It was suggested that the National Spray Equipment Manufacturers Association (NSEMA) coordinate industry responses on transfer efficiency. Exception was taken to NSEMA not being contacted during development of this standard.

Response: EPA believes that to reflect the BDT for the large appliance coating industry, emission limits for new sources must incorporate the use of both high-solids coatings and relatively efficient application equipment, but must not at the same time deny industry flexibility to use different types of application equipment and different coatings. For this reason, the Agency has included the key transfer efficiency concept in this standard.

The commenter's claim that all the listed parameters affect transfer efficiency is correct. However, a universally acceptable test method for determining precise transfer efficiency under each conceivable set of variables has not yet been developed. This means that the Agency must either delete this crucial component of BDT or instead include in the standard assigned transfer efficiency values that correlate at least generally to the efficiencies of the application equipment used in the industry. EPA has chosen the latter course. The Agency has included values that are correlated to each piece of equipment and are sufficiently high to ensure that, regardless of coating properties and other relevant variables, each facility will be credited with at least the efficiency its equipment attains with the particular coatings it applies. These transfer efficiencies listed are based on data provided by spray equipment manufacturers and results of tests conducted during standard development. EPA contacted and visited several equipment and coatings manufacturers during the standard development process. Summaries of these contacts are contained in Docket Category II.

Moreover, the standard provides that if the operator can demonstrate to the satisfaction of the Administrator that other transfer efficiencies are appropriate (e.g., due to variables such as those cited in the

comment), the Administrator will approve their use on a case-by-case basis. This provision ensures that a facility using equipment that achieves an efficiency greater than that assigned by the standard is fully credited for the efficiency achieved.

2.2.3 Comment: (IV-D-5) The equation relating transfer efficiency to maximum allowable VOC content is in error in that it incorrectly assumes:

- A linear relationship between the pigment and the binder for all coatings types;
- An equal density for all types of pigments; and
- An equal volume solids for all types of resins.

Response: The comment implies that the solids in a coating are a mixture of components; e.g., pigments, resins, and binders, whose relative ratio may vary from coating to coating, even if the organic-solvent content remains constant. This variance, coupled with differing physical properties, could result in different coatings with the same organic-solvent content being transferred at different efficiencies. As in the response to the previous comment, it is acknowledged that the method used to incorporate transfer efficiency into this regulation is not perfect. Nonetheless, the resulting improvements in equity and the additional flexibility afforded manufacturers are seen as ample justification to include the concept in the standard at this time. Improved precision will be incorporated as standard test methods are developed.

2.2.4 Comment: (IV-D-8) The case-by-case request for determining alternate transfer efficiencies additionally burdens suppliers of high-performance equipment who will have to prove continually that their equipment performs better than the ratings. This will cause unnecessary delays and additional expense.

Response: Listed transfer efficiencies for high-performance equipment are based on test data and data provided by equipment manufacturers. As discussed in the response to comment 2.2.2, above, the values assigned are sufficiently high that EPA is reasonably confident that each facility will be credited with at least the efficiency its equipment

attains. The burden of proof that equipment performs better than these estimations must fall on the user. However, such a demonstration will only be required once for any particular make and model of equipment and not continually as the commenter believes.

2.2.5 Comment: (IV-D-13) One commenter noted that the potential for cost effectiveness and overall performance of regenerative thermal oxidation systems was not included in background documentation for the proposed standard. A system designed by this company is said to be capable of providing primary heat exchange efficiencies of up to 95 percent in the thermal oxidation process. The high thermal energy recovery of this system allows operation in a self-sustaining mode on hydrocarbon contents of from 3 to 5 percent of the lower explosive limit (LEL). Little or no additional fuel is required. This system virtually eliminates the following problem areas generally associated with incineration systems:

- Fouling of heat transfer surfaces,
- Corrosion,
- Catalyst poisoning,
- Secondary emissions, and
- High operating costs with low-LEL gas streams.

The commenter requested clarification of the potential of regenerative thermal oxidation systems in the documentation for the promulgated standard.

Response: Regulatory Alternative B-III, outlined in Chapter 6 of the BID, presents EPA's analysis of incineration of the topcoat exhaust. The analysis reveals that this option has a signficantly greater capital investment and an increase in energy consumption over other options. Although the annual operating costs and energy use of a regenerative thermal oxidation system may be lower, initial capital investment is large compared to that for low-solvent coatings technology. Reduction in total organic-solvent emissions realized by controlling the topcoat oven exhaust is small because only 20 percent of these emissions are concentrated in the oven. The remaining 80 percent of the emissions are fugitives from the

application and flashoff areas. The small percentage of emissions available for reduction by incineration makes any incinerator difficult to cost justify when compared to low-solvent coatings. For this reason and others set forth in the preamble to the proposal, EPA has decided to base the standard on low-solvent processes, rather than on incineration. Therefore, EPA does not consider necessary further clarification of the potential of regenerative thermal oxidation systems in the documentation for the promulgated standard.

2.2.6 Comment: (IV-F-1a) One commenter stated that one large company is using powder coatings on range hoods, but in a small plant physical space limitations make it impossible to put in a separate powder system for each of five appliance colors. In addition, the cost of such systems would be prohibitive.

Response: EPA has found no instances when technical considerations demanded use of powder coatings to achieve compliance with the proposed standard. High-solids coatings are available and can be applied at reasonable cost. However, one commenter (IV-D-6) has stated that the electrostatic coating techniques, commonly used in the large appliance industry, are not technically practical for applying coatings to parts with numerous corners, such as range hoods. For this reason and as discussed in the response to comment 2.1.1, range hoods, fans, and similar products are not being included in the promulgated standard.

2.3 MODIFICATION AND RECONSTRUCTION

2.3.1 Comment: (IV-F-1a) One commenter expressed concern that in modifying facilities to meet State requirements, he would also be covered under this more restrictive Federal regulation.

Response: It is possible that when an existing facility is modified to meet a State requirement, capital costs incurred could be large enough to trigger reconstruction provisions of the Federal regulations, thereby forcing compliance with the Federal requirement. The commenter was the manufacturer of range hoods scheduled to attain compliance by January 1983 with a standard less strict than the NSPS. This State standard is based upon the CTG-recommended emission limit for miscellaneous metal parts and products. This was a valid concern at the time the standard was proposed.

However, since proposal, the list of products to be covered in the standard has been revised and manufacturers of range hoods will not be subject to the final standard. The similarity between the CTG-recommended State limits and the NSPS for the appliance products that will be subject to the promulgated standard obviates this as an issue.

2.4 ECONOMIC IMPACT

2.4.1 Comment: (IV-D-4) Imposition of the proposed standard on the wood stove industry would create economic hardships that could force discontinuance of the manufacture of these devices. Therefore, wood stoves and room heaters should not be included as products to be covered in this regulation.

Response: Furnaces and room heaters were included in the proposed regulation. However, it was never intended that wood stoves or direct-fired room heaters would be included in this regulation. For reasons discussed in Subsection 2.1, furnaces and room heaters have been deleted from the list of appliance products covered by this regulation.

2.4.2 Comment: (IV-D-12) One commenter questioned the validity of the cost data upon which the standard was based. (A followup telephone conversation[7] with the commenter revealed that the costs of concern were those pertaining to powder application. These costs were considered too low.) It was also requested that cost data be solicited from the industry through NSEMA for additional analysis.

Response: Data for the cost analysis were obtained from a number of different industrial sources, including appliance manufacturers, coating manufacturers, and application equipment manufacturers. These data are available in Docket Subcategory II-D. EPA predicts NSEMA data would be from the same basic sources. No additional analyses have been performed as a result of this comment because the use of powder coating was not selected as the basis for the standard. Therefore, an understatement of powder costs would not generate erroneous conclusions regarding the standard's economic impact.

2.5 ENVIRONMENTAL IMPACT

2.5.1 Comment: (IV-D-5) One commenter stated that increased use of high-solids coatings will lead to entrapment of increased quantities of

solids in the spray booth wash water regardless of transfer efficiency, while another commenter (IV-D-8) stated that increased transfer efficiency will directly reduce solid waste generation regardless of solids content.

Response: The quantity of solids in overspray depends solely upon the transfer efficiency of the application equipment. As used in this regulation, transfer efficiency is defined as the ratio of the amount of coating solids deposited onto the surface of an appliance part or product to the total amount of coating solids used. Use of increased transfer efficiency as a means of compliance will therefore decrease the solid waste generated.

If compliance is to be attained by increasing the solids content of the coating, the relationship is not as direct. Information obtained subsequent to proposal[8] indicates that the transfer efficiency for a given piece of application equipment may vary somewhat with differing solids contents. This is more apparent at levels of solids in excess of 70 percent by volume. It is the Administrator's judgment, however, that within a realistic range of solids contents (30 to 76 percent [vol.]), the quantity of solids not applied to a coated object (i.e., overspray) that may become entrapped in spray booth wash water depends to a greater extent upon the relative efficiencies of families of application equipment (i.e., transfer efficiency) than upon the solids content of the coatings.

2.5.2 Comment: (IV-D-8) One commenter stated that the generic classifications of equipment in Table 2-1 (Section 60.453) are poorly defined and inappropriate. The Agency's listing of transfer efficiencies for generic equipment will encourage the use of lower priced, inferior equipment that does not perform as well as the Agency has indicated. The listing will also discourage use of equipment that presently exceeds listed values, since added credit may be difficult to obtain. For this reason, the Agency's estimates of emission reductions are overstated and the objectives will not be met. The commenter suggested that a standardized test method be adopted to determine transfer efficiency. Equipment could then be "certified" by the manufacturer and a list of equipment ratings and operating conditions could be supplied to EPA for publication. The equipment operator should be required to use these published transfer efficiencies to determine compliance.

Response: The promulgated standard will significantly benefit the users of equipment that has a high transfer efficiency because of the flexibility of coating selection that it will afford. Incorporation of the transfer efficiency concept in this proposed standard is one of the main improvements over the earlier RACT guidelines and existing State regulations because the existing regulations do not give credit for transfer efficiency. This regulation includes a provision by which an owner or operator may request approval by the Administrator to use a transfer efficiency higher than those listed in the regulation. Additionally, the regulation provides that transfer efficiencies for application methods not included in the regulation will be determined by the Administrator on a case-by-case basis.

EPA recognizes that the actual transfer efficiency achieved in production line situations depends on a large number of variables. It was this difficulty in determining transfer efficiency values that caused EPA to use the table of assigned numbers. Any improvement in the efficiency at which coatings are applied will benefit both the EPA's goal of reducing VOC emissions and the industry's goal of achieving more economical operation. A more detailed listing of transfer efficiency values would require a uniform test method for all situations. Such a method has not yet been developed but is under investigation by EPA's Industrial Environmental Research Laboratory (IERL). The Agency does not believe the listed transfer efficiencies will promote the use of inferior equipment because operating cost advantages, such as decreased coating usage, will dictate the use of efficient equipment and encourage its proper operation.

2.5.3 Comment: (IV-H-2) The stated particle size classes of powder coatings (page 3-14 of the BID [Industrial Surface Coating: Appliances--Background Information for Proposed Standards, EPA-450/3-80-037a]) do not appear to represent a respirable dust hazard. However, fine autogenously produced dusts may pose a health hazard if they contain toxic pigments such as lead or chromate. Also, as noted in the BID, for powder coatings there are potential VOC emissions from the curing process. It is unfortunate that EPA did not obtain sampling data from this process or other processes. EPA and the National Institute of Occupational

Safety and Health (NIOSH) are both interested in paint and coating operations, with few apparent mutual benefits from field studies by either party alone.

Response: As noted on page 3-15 of the BID, the potential VOC emissions from powder coatings are post-application emissions that can occur during the heat merging of powder particles in the oven. Data concerning these emissions are limited, but no evidence indicates that the quantity of these emissions is significant. Powder coatings, therefore, have been exluded from all requirements in the promulgated regulation. Contact with a major manufacturer of appliance powder coatings subsequent to proposal[9] indicates that all of these coatings either are or very soon will be lead and chromate free. Data for all organic-solvent emissions were calculated by mass balance, an accurate, accepted method for compounds that completely evaporate during a process. Use of this method precluded the need for emissions tests, and, therefore, sampling data were not obtained.

2.6 ENERGY IMPACT

2.6.1 Comment: (IV-D-5) One commenter took exception to EPA's conclusion that the reduced air flow rates used in ovens where waterborne coatings are cured would save energy. The commenter stated that increased energy usage would result from using waterborne coatings, compared to conventional organic-solvent-borne coatings.

Response: Energy required to evaporate solvent (whether water or organic) amounts to less than 10 percent of the total energy used within the large appliance surface coating industry. Some debate continues within the industry over the energy savings attributable to waterborne coatings. EPA's conclusion that an energy reduction would result is based upon the fact that less airflow would be required to maintain oven concentrations of organic-solvents below 25 percent of the LEL for waterborne coatings. Control of relative humidity to ensure proper curing of the coating was not considered in the analysis but likely could require increased, rather than decreased, airflow and require proportionally more energy than

solvent-borne coatings. Any error introduced by this oversight, however, is minor and would not invalidate the general conclusions reached concerning energy usage.

2.7 REPORTING AND RECORDKEEPING

2.7.1 Comment: (IV-D-8) Powder coating systems should be declared in full compliance, with no requirements for reports and recordkeeping.

Response: Powder coating systems for large appliances are excluded from the promulgated standard.

2.7.2 Comment: (IV-D-10, IV-F-1b) One commenter expressed concern over the time a facility would need for recordkeeping and reporting to determine monthly compliance as proposed in the regulation and stated that an added overhead burden would be placed on the industries that would ultimately be passed on to the consumer. Another commenter estimated that it would probably require 1 person per year at each affected plant, considerably more than estimated in the preamble.

Response: The requirement to report violations of monthly compliance tests has been removed since proposal. In the preamble to the regulation it was estimated that in the fifth year of applicability the promulgated regulation would apply to 160 affected facilities and over these 5 years require about 40 industry person-years for recordkeeping and reporting. This amounts to about 1 person-month per affected facility per year.[10] (Because all reporting requirements except for the initial performance test results have been eliminated from the standard, and because of the requirement to estimate the Agency resources needed for observing performance tests and for litigation, the Reports Impact Analysis has been revised since proposal. It is now estimated that the industry burden for recordkeeping and reporting will be 28 person-years over the first 5 years of applicability.) Information a manufacturer needs to keep on a day-to-day basis to determine compliance with this standard includes volume of coating used and volume of dilution solvent used. These data are normally kept by companies to provide adequate stock room balances of needed supplies. The other item of information needed to determine compliance, the fraction of solids in the coating, can be obtained from the coating manufacturer. The recording of these data is important to both the

owner/operator and to EPA to determine that the source is in compliance. EPA considers the lower time estimates in the Reports Impact Analysis to be reasonably accurate. Therefore, the Agency does not consider the record-keeping, which is necessary to determine compliance, an unreasonable burden.

2.7.3 Comment: (IV-D-9) If range hoods and fans are included in the regulation, recordkeeping and reporting requirements will cost one company in excess of $20,000 per year and will require the hiring of a fulltime employee for the job.

Response: Based on information provided by manufacturers, which has been discussed in previous sections, range hoods and fans are being excluded from the promulgated standard. Therefore, the comment does not warrant further consideration. However, EPA has determined the costs and person-hours to be significantly lower than those stated by the commenter.

2.7.4 Comment: A comment received during development of another surface coating standard that is considered applicable to large appliance surface coating indicated that the 10-calendar-day period within which violations of the standard must be reported was insufficient to permit the coordination and clearances required to notify EPA that a violation has occurred.

Response: As a result of this comment and others, EPA has been investigating alternative ways of reducing monitoring, recordkeeping, and reporting burdens on owners and operators. The goal is to reduce all recordkeeping and reporting not essential to determining compliance or to ensuring proper operation and maintenance. After reviewing requirements in the proposal, EPA determined that monthly compliance tests, monitoring, and compilation of monitoring data are essential for both the owner or operator and EPA to determine compliance and to ensure proper operation and maintenance. A responsible owner or operator would need monitoring information compiled in a usable form to determine when adjustments in the control system are needed to ensure that it is performing at its intended effectiveness level.

EPA is therefore requiring only the additional step of filing the information in an accessible location. Because EPA judges that monthly

compliance tests, monitoring, and recordkeeping are essential for determining compliance and proper operation and maintenance, these requirements have not been changed since proposal. It was judged, however, that reporting is not essential to EPA. In addition, when States are delegated the authority to enforce this standard, they may prefer either not to have reporting or to have reporting on a different schedule than EPA proposed. Therefore, the requirement to report violations of the standard and quarterly incineration reports has been removed since proposal. A State, however, at any time is free to impose its own reporting requirements in conjunction with this regulation.

## 2.8 REFERENCES


1. Letter from Daum, K. A., Research Triangle Institute, to Bill Anthony, Glidden Coatings and Resins Company. May 5, 1981. Enclosing telecon regarding a proposed method to exclude high-temperature-resistant coatings from the large appliance surface coating standard. (Docket Entry IV-E-3.)

2. Letter from Daum, K. A., Research Triangle Institute, to Norm Emily, General Electric Company. May 5, 1981. Enclosing May 1 telecon for confirmation or correction of contents. (Docket Entry IV-E-4.)

3. Letter from Daum, K. A., Research Triangle Institute, to T. H. Goodgame, Whirlpool Corporation. May 7, 1981. Enclosing May 7 telecon for confirmation or correction of contents. (Docket Entry IV-E-5.)

4. Letter from Tabler, S. K., Standards Development Branch, U.S. Environmental Protection Agency, to H. Thomas, Broan Manufacturing Company, Inc. February 3, 1981. Followup of post-public hearing discussion. (Docket Entry IV-C-6.)

5. Letter from McCrodden, B. J., Research Triangle Institute, to D. W. Sanford, Home Ventilating Institute. February 3, 1981. Enclosing questions concerning impact of proposed standards on the industry. (Docket Entry IV-C-7.)

6. Transcript of Public Hearing, Standards of Performance for New Stationary Sources: Appliance Surface Coating. U.S. Environmental Protection Agency. Research Triangle Park, North Carolina. January 28, 1981. (Docket Entry IV-F-1.)

7. Letter from McCrodden, B. J., Research Triangle Institute, to M. Miller, Graco, Inc. April 23, 1981. Enclosing March 27 telecon for confirmation or correction. (Docket Entry IV-E-2.)

8. Letter from McCrodden, B. J., Research Triangle Institute, to R. M. Acker, Ransburg Electrostatic Equipment Corporation. August 11, 1981. June 16, 1981, telecon regarding relationship of coating solids content and transfer efficiency. (Docket Entry IV-E-11.)

9. Letter from McCrodden, B. J., Research Triangle Institute, to R. F. Farrell, Glidden Powder Coatings. July 15, 1981. Enclosing June 19, 1981, telecon regarding heavy metals in powder coatings. (Docket Entry IV-E-10.)

10. Reports Impact Analysis: Appliance Surface Coating Operations. U.S. Environmental Protection Agency. September 1980. (Docket Entry II-I-20.)

# APPENDIX A

# REVISED EMISSIONS ESTIMATES

# APPENDIX A--REVISED EMISSIONS ESTIMATES

## A.1 INTRODUCTION

At the time emissions estimates for the proposed standard were prepared, State Implementation Plan (SIP) regulations were being revised for localities considered to be nonattainment areas for achieving the National Ambient Air Quality Standard (NAAQS) for ozone. Most existing large appliance manufacturing plants are located in such areas, and it was expected that new facilities would locate in similar areas. In revising their SIPs, most States were relying upon the Control Techniques Guidelines (CTG) Document, Control of Volatile Organic Emissions from Existing Stationary Sources--Volume V: Surface Coating of Large Appliances (EPA-450/2-77-034[CTG]). It appeared that most States were adopting the CTG recommendations statewide, in attainment as well as in nonattainment areas. For this reason, no distinction was made between the "no additional regulation" alternative and the alternative eventually selected as best demonstrated technology (BDT). Both were based upon 62 percent (vol.) solids coatings, and the transfer efficiency incorporated into the BDT alternative was an estimate of the average transfer efficiency actually achieved in the industry. Therefore, in the documents supporting the proposed standard, the emissions reduction attributable to the New Source Performance Standard (NSPS) was reported as "minimal." Full documentation of the original estimates is contained in the Background Information Document (BID) for the proposed standard, Industrial Surface Coating: Appliances--Background Information for Proposed Standards (EPA-450/3-80-037a).

Now that the majority of SIP revisions have been approved, it is possible to refine the emissions estimates. This study was prompted by the realization that fewer States than originally expected have

adopted the CTG-recommended emission limit in attainment areas as well as in nonattainment areas. To the extent possible, the format used here parallels that used in the BID for the proposed standard so comparisons can be made easily.

It was first necessary to determine regulations in existence or scheduled to be implemented prior to 1986 in order to determine the fraction of large appliance manufacturing plants that would be subject to more stringent emission limits as a result of NSPS. Assuming new plants will be geographically distributed in the same manner as are existing plants, it is then possible to estimate the impact of NSPS. A list of 104 major household appliance manufacturing plants was developed based on the 1981 "Who's Who in The Industry" from Appliance magazine,[1] supplemented with knowledge of individual plants acquired during standard development. The list, together with the applicable State regulation, is included as Annex 1 to this appendix. State emission limits were obtained primarily from an EPA summary of volatile organic compound (VOC) reasonably available control technology (RACT) regulations[2] and examination of individual State regulations, where needed.

Of the 104 listed major household appliance manufacturing plants, 68 are located in nonattainment areas. Of the 36 remaining, 25 are (or would be if they were new) subject to regulation at least as strict as the CTG-recommended limit of 2.8 pounds of VOC per gallon of coating (minus water).* Thus, 89 percent of known existing plants are (or would be if they were new) subject to the CTG-recommended limit. Assuming, as we do, that the industry average transfer efficiency is 60 percent, the CTG-recommended limit approximates the NSPS limit of 0.90 kilogram of VOC per liter of applied coating solids.† In

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*Hereafter, 2.8 pounds of VOC per gallon of coating (minus water) is abbreviated as 2.8 lb/gal.

†The difference between the two levels results because the transfer efficiency dictated by the NSPS is the minimum that can be used with a coating of that given solids content; e.g., a 62-percent (vol.) solids coating would require at least a 60-percent transfer efficiency. The average transfer efficiency will, therefore, be somewhat higher than the minimum required. The difference between the CTG-recommended limit and the NSPS limit is, however, considered minimal.

addition to assuming the new plants will be geographically distributed in the same manner as existing plants are, the revised estimates are based on assumptions that:

- Plants brought under the NSPS because of modification or reconstruction provisions also will be similarly distributed, and
- All plants are of equal size.

The effect of these assumptions is that the baseline from which the NSPS emissions impact is measured is the average State regulation weighted in proportion to the number of existing plants subject to each regulation. For example, the 1981 estimate assumes that 89 percent of all production is subject to the CTG/NSPS limit and that the remaining 11 percent is completely uncontrolled.

Revised annual VOC emissions estimates are shown in Table A-1. Only the appliance products that will be subject to the final standard are included. Annual production estimates also have been updated from those in the BID for the proposed standard. For comparison, these new estimates have been superimposed on a graph of the comparable, earlier estimates (see Figure A-1).

## A.2 COMMENTS/ANALYSIS

When the accuracy of these estimates is assessed, the following facts should be considered. The impact of the NSPS may be more than that calculated because commercial appliances will be subject to the standard but were not included in the production figures. The following three factors, however, would have the opposite effect. The impact may be overstated because plants were assumed to meet the emission limit exactly, whereas some plants actually use technologies, such as powder, that yield substantially fewer emissions. Also, emissions for uncontrolled plants were based on 30 percent (vol.) solids coatings and a 50-percent transfer efficiency. The assumption is that a new plant would select the same coating system if there were no air pollution regulations. This may not be true, however. Partially as a result of the pressure of air pollution regulations but also because of petroleum-based economic pressures, improvements have

# TABLE A-1. REVISED ANNUAL VOC EMISSIONS ESTIMATES: 1976, 1981, 1986

| Product | Production ($10^3$ units)[a] | | | Prime coat | | | | | | Top coat | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Annual VOC emissions (Mg)[b] | | | | | | Annual VOC emissions (Mg)[c] | | | |
| | | | | | | | | 1986 | | | | | | 1986 | |
| | 1976 | 1981 | 1986 | Area ($m^2$) | t μm | 1976 | 1981 | No NSPS | NSPS | Area ($m^2$) | t μm | 1976 | 1981 | No NSPS | NSPS |
| Compactor | 249 | 258 | 336 | 2.0 | 12 | 24 | 8 | 10 | 9 | 2.0 | 20 | 40 | 13 | 16 | 15 |
| Dishwasher | 3,140 | 2,990 | 3,927 | 1.0 | 12 | 152 | 44 | 58 | 52 | 1.0 | 20 | 254 | 74 | 97 | 86 |
| Dryer | 3,173 | 3,276 | 4,258 | 8.5 | 15 | 1,637 | 515 | 669 | 597 | 2.75 | 30 | 1,059 | 333 | 433 | 386 |
| Freezer | 1,542 | 2,055 | 2,514 | 7.0 | 12 | 519 | 213 | 260 | 235 | 7.0 | 20 | 864 | 355 | 434 | 392 |
| Microwave oven | 1,749 | 4,003 | 6,049 | 0.75 | 12 | 64 | 44 | 67 | 58 | 0.75 | 20 | 106 | 74 | 112 | 97 |
| Range | 4,287 | 4,428 | 5,709 | 1.75 | 12 | 364 | 115 | 148 | 132 | 3.0 | 20 | 1,040 | 328 | 422 | 377 |
| Refrigerator | 4,817 | 5,732 | 7,153 | 7.0 | 12 | 1,642 | 594 | 741 | 666 | 7.0 | 20 | 2,737 | 990 | 1,235 | 1,110 |
| Washer | 4,492 | 4,538 | 5,843 | 6.50 | 15 | 1,722 | 546 | 702 | 628 | 2.25 | 30 | 1,227 | 378 | 486 | 434 |
| Water heater | 5,728 | 5,337 | 7,159 | 2.0 | 12 | 556 | 158 | 212 | 188 | 2.0 | 20 | 927 | 263 | 353 | 313 |
| Total | | | | | | 6,730 | 2,237 | 2,867 | 2,565 | | | 8,254 | 2,808 | 3,588 | 3,210 |

Note: The entries are shown for comparison. They should not be taken to indicate the precision of the data.

[a]Production data:

1976: yearly production figure for each appliance from Appliance magazine, April 1980.[3]
1981: yearly production figure for each appliance from Appliance magazine, January 1981.[4]
1986: yearly production figure for each appliance from Appliance magazine, January 1981.[4].

[b]Prime coat emissions:

1976: equivalent to coatings containing 30 percent (vol.) solids applied at a transfer efficiency of 50 percent.
1981: 89 percent of production coated with a system the equivalent of the CTG-recommended coating containing 62 percent (vol.) solids applied at a transfer efficiency of 60 percent.
11 percent of production coated with a system the equivalent of a coating containing 30 percent (vol.) solids applied at a transfer efficiency of 50 percent.
1986: All growth between 1981 and 1986 subject to NSPS of 0.90 kg VOC per liter of applied coating solids (equivalent to the CTG-recommended coating containing 62 percent (vol.) solids applied at a transfer efficiency of 60 percent).
20 percent of the previously uncontrolled production will be subject to NSPS because of modification/reconstruction provisions (i.e., 0.912 of 1981 production coated with a system the equivalent of the CTG-recommended coating containing 62 percent (vol.) solids applied at a transfer efficiency of 60 percent; 0.088 of 1981 production coated with a system the equivalent of a coating containing 30 percent (vol.) solids applied at a transfer efficiency of 50 percent.

[c]Topcoat emissions:

1976: equivalent to coatings containing 30 percent (vol.) solids applied at a transfer efficiency of 50 percent.
1981: 89 percent of production coated with a system the equivalent of the CTG-recommended coating containing 62 percent (vol.) solids applied at a transfer efficiency of 60 percent.
11 percent of production coated with a system the equivalent of a coating containing 30 percent (vol.) solids applied at a transfer efficiency of 50 percent.
1986: All growth between 1981 and 1986 subject to NSPS of 0.90 kg VOC per liter of applied coating solids (equivalent to the CTG-recommended coating containing 62 percent (vol.) solids applied at a transfer efficiency of 60 percent).
20 percent of the previously uncontrolled production will be subject to NSPS because of modification/reconstruction provisions (i.e., 0.912 of 1981 production coated with a system the equivalent of the CTG-recommended coating containing 62 percent (vol.) solids applied at a transfer efficiency of 60 percent; 0.088 of 1981 production coated with a system the equivalent of a coating containing 30 percent (vol.) solids applied at a transfer efficiency of 50 percent.

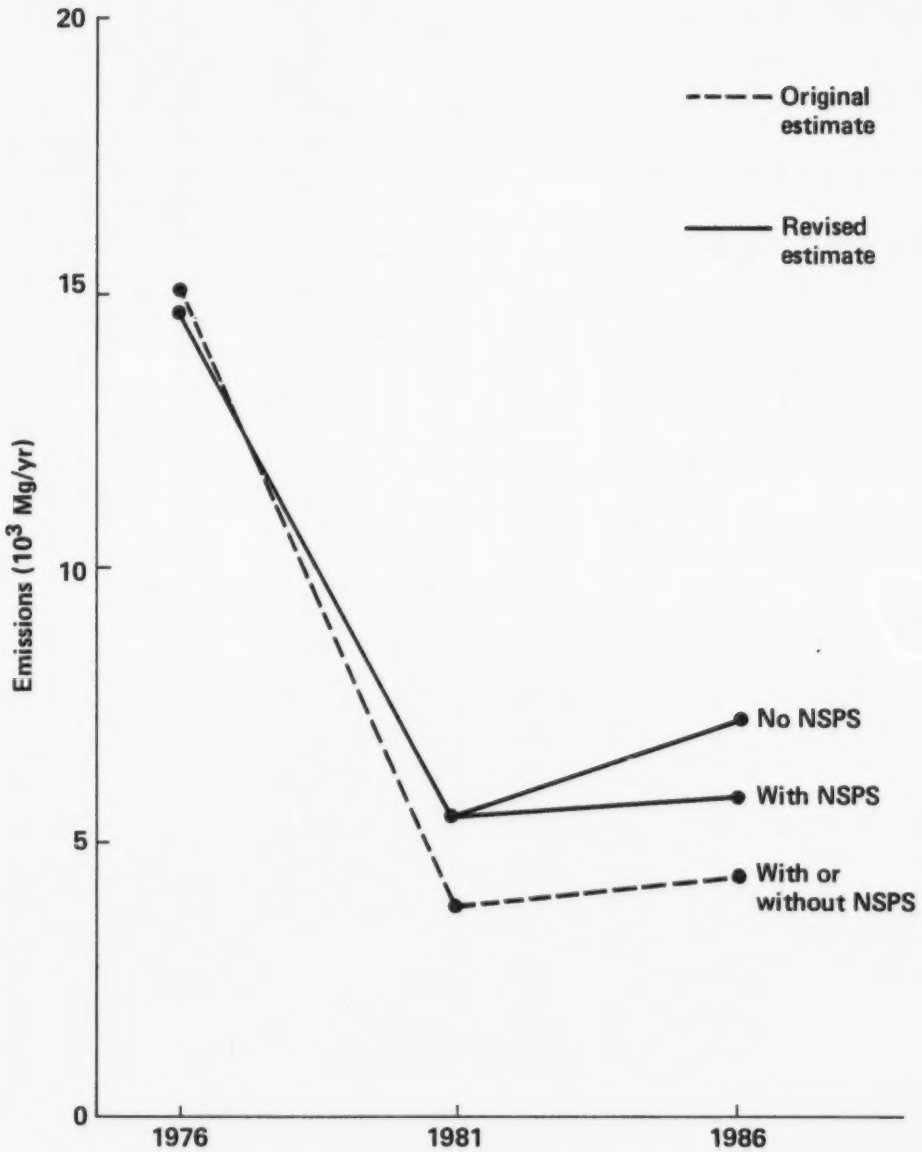


Figure A-1. Combined annual emissions (prime coat and topcoat) for large appliance surface coating operations.

been made in coatings and application methods that might supplant the 30-percent solids, 50-percent transfer efficiency base case. The third factor is the validity of the presumption that all growth between 1981 and 1986 will occur in plants subject to the NSPS. There is considerable unused capacity in the appliance industry and, to the extent that growth will be accommodated through increased use of existing capacity, the emissions reduction attributable to the NSPS may be overstated.

## A.3 REFERENCES


1. A Portrait of the U.S. Appliance Industry--1981. Appliance. September 1981.

2. Capone, Stephen V., Richard M. Rehm, Andrea M. Kiddie, and David C. Misenheimer. Status Summary of State's Group I VOC RACT Regulations as of June 1, 1981; Second Interim Report. GCA Corporation. Bedford, Massachusetts. (Prepared for U.S. Office of Air Quality Planning and Standards, U.S. Environmental Protection Agency. Research Triangle Park, North Carolina.) July 1981. 183 p.

3. Statistical Review. Appliance. April 1980.

4. Stevens, James, and David E. Simpson. Twenty-Ninth Annual Forecasts. Appliance. January 1981.

## ANNEX 1--MAJOR HOUSEHOLD APPLIANCE MANUFACTURING PLANTS

Absocold Corporation
Richmond, Indiana (Wayne County - 2.8 lb/gal for new sources over 25 TPY)

Admiral Division of Magic Chef, Inc.
Galesburg, Illinois (Knox County) - 2.8 lb/gal)

Amana Refrigeration, Inc.
Amana, Iowa (Iowa County - no standard)

Amana Refrigeration, Inc.
Fayetteville, Tennessee (Lincoln County - 2.8 lb/gal)

American Appliance Manufacturing Corporation
Santa Monica, California (Los Angeles County [nonattainment] - 2.8 lb/gal)

Anaheim Manufacturing Company
Anaheim, California (Orange County [nonattainment] - 2.8 lb/gal)

Anetsberger Brothers, Inc.
Northbrook, Illinois (Cook County [nonattainment] - 2.8 lb/gal

Athens Stove Works
Athens, Tennessee (McMinn County - 2.8 lb/gal)

Bock Corporation
Madison, Wisconsin (Dave County [nonattainment] - 2.8 lb/gal)

Bradford-White Corporation
Middleville, Michigan (Barry County [nonattainment] - 2.8 lb/gal)

Broan Manufacturing Company, Inc.
Hartford, Wisconsin (Washington County - 2.8 lb/gal)

Broan Manufacturing Company, Inc.
Old Forge, Pennsylvania (Lackawanna County [nonattainment] - 2.8 lb/gal)

Brown Stove Works, Inc.
Cleveland, Tennessee (Bradley County [nonattainment] - 2.8 lb/gal)

Caloric Corporation
Topton, Pennsylvania (Berks County [nonattainment] - 2.8 lb/gal)

Chambers Corporation
Oxford, Massachusetts (LaFayette County - no standard)

Charmglow Products
Bristol, Wisconsin (Kenosha County [nonattainment] - 2.8 lb/gal)

Columbus Products Company
(While Consolidated Industries) Columbus, Ohio (Franklin County [nonattainment] - 2.8 lb/gal)

Design and Manufacturing Corporation
Connersville, Indiana (Fayette County - 2.8 lb/gal for new sources over 25 TPY)

Design and Manufacturing Corporation
Richmond, Indiana (Wayne County - 2.8 lb/gal for new sources over 25 TPY)

Dwyer Products Corporation
Michigan City, Indiana (La Porte County - 2.8 lb/gal for new sources over 25 TPY)

Emerson Quiet Kool Corporation
Woodbridge, New Jersey (Middlesex County [nonattainment] - 2.8 lb/gal)

Franklin Manufacturing Company
(White Consolidated Industries) St. Cloud, Minnesota (Benton County - no standard)

GR Manufacturing Company
(White Consolidated Industries) Grand Rapids, Michigan (Kent County [nonattainment] - 2.8 lb/gal)

General Electric Company
Laundry and Dishwasher Products Division, Appliance Park, Kentucky (Jefferson County [nonattainment] - 2.8 lb/gal)

General Electric Company
Range Products Division, Appliance Park, Kentucky (Jefferson County [nonattainment] - 2.8 lb/gal)

General Electric Company
Refrigeration Products Division, Appliance Park, Kentucky (Jefferson County [nonattainment] - 2.8 lb/gal)

General Electric Company
Bloomington, Indiana (Monroe County - 2.8 lb/gal for new sources over 25 TPY)

General Electric Company
Cicero, Illinois (Cook County [nonattainment] - 2.8 lb/gal)

General Electric Company
Columbia, Maryland (Howard County [nonattainment] - 2.8 lb/gal)

General Electric Company
Decatur, Alabama (Morgan County [nonattainment] - 2.8 lb/gal)

General Electric Company
Milwaukee, Wisconsin (Milwaukee County [nonattainment] - 2.8 lb/gal)

The Glass-Lined Water Heater Company
Cleveland, Ohio (Cuyahoga County [nonattainment] - 2.8 lb/gal)

Glenwood Range Company
(Caloric Corporation) Delaware, Ohio (Delaware County [nonattainment] - 2.8 lb/gal)

Gray & Dudley Company
Nashville, Tennessee (Davidson County [nonattainment] - 2.8 lb/gal)

Greenville Products Company
(White Consolidated Industries) Greenville, Michigan (Montcalm County [nonattainment] - 2.8 lb/gal)

Hardwick Stove Company
(Maytag) Cleveland, Tennessee (Bradley County [nonattainment] - 2.8 lb/gal)

Hobart Corporation
Louisville, Kentucky (Jefferson County [nonattainment] - 2.8 lb/gal)

Hobart Corporation
Mt. Sterling, Kentucky (Montgomery County - 15% [wt.] net VOC input--assumed to be 2.8 lb/gal)

The Hoover Company
North Canton, Ohio (Stark County [nonattainment] - 2.8 lb/gal)

Hoyt Heater Company of Northern California
Oakland, California (Alameda County [nonattainment] - 2.8 lb/gal)

Hussman Refrigerator Company
Fremont, California (Alameda County [nonattainment] - 2.8 lb/gal)

Indesit, Inc.
Harriman, New York (Orange County [nonattainment] - 2.8 lb/gal)

Independent Refrigeration Manufacturers
Millstadt, Illinois (St. Clair County [nonattainment] - 2.8 lb/gal)

In-Sink-Erator Division
(Emerson Electric Company) Racine, Wisconsin (Racine County [nonattainment] - 2.8 lb/gal)

W. L. Jackson Manufacturing Company, Inc.
(Bradford-White Corporation) Chattanooga, Tennessee (Hamilton County [nonattainment] - 2.8 lb/gal)

Jenn-Air Corporation
Indianapolis, Indiana (Marion County [nonattainment] - 2.8 lb/gal)

Litton Microwave Cooking Products
Minneapolis, Minnesota (Hennepin County - no standard)

Litton Microwave Cooking Products
Sioux Falls, South Dakota (Minnehaha County - no standard)

Lochinvar Water Heater Corporation
Nashville, Tennessee (Davidson County [nonattainment] - 2.8 lb/gal)

Magic Chef Microwave Division
Anniston, Alabama (Calhoun County - 2.8 lb/gal)

Magic Chef, Inc.
Cleveland, Tennessee (Bradley County [nonattainment] - 2.8 lb/gal)

Magic Chef West
Los Angeles, California (Los Angeles County [nonattainment] - 2.8 lb/gal)

Mansfield Products Company
(White Consolidated Industries) Mansfield, Ohio (Richland County [nonattainment] - 2.8 lb/gal)

The Maytag Company
Newton, Iowa (Jasper County - no standard)

Modern Maid Company
Chattanooga, Tennessee (Hamilton County [nonattainment] - 2.8 lb/gal)

Monarch Range and Heater Division
(Malleable Iron Range Company) Beaver Dam, Wisconsin (Dodge County - 2.8 lb/gal)

Mor-Flo Industries, Inc.
Johnson City, Tennessee (Washington County - 2.8 lb/gal)

Norcold, Inc.
(Stolle Corporation) Sidney, Ohio (Shelby County [nonattainment] - 2.8 lb/gal)

Norge Division of Magic Chef
Herrin, Illinois (Williamson County [nonattainment] - 2.8 lb/gal)

Northland Refrigeration Company
Greenville, Michigan (Montcalm County [nonattainment] - 2.8 lb/gal)

Northern Metal Specialty Division
(Western Industries) Osceola, Wisconsin (Polk County - 2.8 lb/gal over 100 TPY potential)

Panasonic Company
(Matsushita Electric Corporation of America) Secaucas, New Jersey (Hudson County [nonattainment] - 2.8 lb/gal)

Philco International Corporation
Blue Bell, Pennsylvania (Montgomery County [nonattainment] - 2.8 lb/gal)

Premier Stove Company
Belleville, Illinois (St. Clair County [nonattainment] - 2.8 lb/gal)

Rangaire Corporation
Cleburne, Texas (Johnson County - no standard)

Revco, Inc.
(Magic Chef) Williston, South Carolina (Richland County - 2.8 lb/gal)

Reynolds Products, Inc.
Schaumburg, Illinois (Du Page County [nonattainment] - 2.8 lb/gal)

Rheem Manufacturing Company
Chicago, Illinois (Cook County [nonattainment] - 2.8 lb/gal)

Rheem Manufacturing Company
Montgomery, Alabama (Montgomery County - 2.8 lb/gal)

Riccar America Company
Costa Mesa, California (Orange County [nonattainment] - 2.8 lb/gal)

Roper Corporation
Kankakee, Illinois (Kankakee County [nonattainment] - 2.8 lb/gal)

Roper Corporation
LaFayette, Georgia (Walker County - 2.8 lb/gal)

Roper Corporation
Chattanooga, Tennessee (Hamilton County [nonattainment] - 2.8 lb/gal)

Sanyo E & E Corporation
San Diego, California (San Diego County [nonattainment] - 2.8 lb/gal)

Sanyo Electric, Inc.
Little Ferry, New Jersey (Bergen County [nonattainment] - 2.8 lb/gal)

Sharp Manufacturing Company of America
Memphis, Tennessee (Shelby County - 2.8 lb/gal)

A. O. Smith Corporation
Kankakee, Illinois (Kankakee County [nonattainment] - 2.8 lb/gal)

A. O. Smith Corporation
Seattle, Washington (King County [nonattainment] - 2.8 lb/gal)

A. O. Smith Corporation
Newark, California (Alameda County [nonattainment] - 2.8 lb/gal)

A. O. Smith Corporation
McBee, South Carolina (Chesterfield County - 2.8 lb/gal)

Speed Queen Company
Ripon, Wisconsin (Fond du Lac County - 2.8 lb/gal)

Speed Queen Company
Searcy, Arkansas (White County - no standard)

State Industries, Inc.
Ashland City, Tennessee (Cheatham County - 2.8 lb/gal)

State Industries, Inc.
Henderson, Nevada (Clark County [nonattainment] - 2.8 lb/gal)

Sub-Zero Freezer Company, Inc.
Madison, Wisconsin (Dave County [nonattainment] - 2.8 lb/gal)

Tappan Appliance Division
(Electrolux) Mansfield, Ohio (Richland County [nonattainment] -
2.8 lb/gal)

Tappan Appliance Division
(Electrolux) Springfield, Tennessee (Robertson County - 2.8 lb/gal)

Tappan Appliance Division
(Electrolux) Dalton, Georgia (Whitfield County - 2.8 lb/gal)

Thermador/Waste King
Brockton, Maine (Plymouth County [nonattainment] - 2.8 lb/gal)

Toshiba America, Inc.
Torrance, California (Los Angeles County [nonattainment] - 2.8 lb/gal)

Vaughn Corporation
Salisbury, Massachusetts (Essex County [nonattainment] - 2.8 lb/gal)

Warwick Manufacturing Company
Chesapeake, Virginia (Chesapeake County [nonattainment] -2.8 lb/gal)

Watertown Metal Products Division
(Western Industries) Watertown, Wisconsin (Dodge/Jefferson Counties -
2.8 lb/gal)

Webster City Products Company
(White Consolidated Industries) Webster City, Iowa (Hamilton County - no standard)

Welbilt Corporation
Maspeth, New York (Kings County [nonattainment] - 2.8 lb/gal)

Whirlpool/St. Joseph
St. Joseph, Michigan (Berrien County [nonattainment] - 2.8 lb/gal)

Whirlpool/St. Paul
St. Paul, Minnesota (Ramsey County - no standard)

Whirlpool Corporation/Evansville Division
Evansville, Indiana (Vanderburgh County [nonattainment] - 2.8 lb/gal)

Whirlpool Corporation/Clyde Division
Clyde, Ohio (Sandusky County [nonattainment] - 2.8 lb/gal)

Whirlpool Corporation/Danville Division
Danville, Kentucky (Boyle County - 2.8 lb/gal)

Whirlpool Corporation/Ft. Smith Division
Ft. Smith, Arkansas (Sebastian County - no standard)

Whirlpool Corporation/Marion Division
Marion, Ohio (Marion County [nonattainment] - 2.8 lb/gal)

Whirlpool Corporation/Findlay Division
Findlay, Ohio (Hancock County [nonattainment] - 2.8 lb/gal)

White-Westinghouse Appliance Company
(White Consolidated Industries) Pittsburgh, Pennsylvania (Allegheny County [nonattainment] - 2.8 lb/gal)